



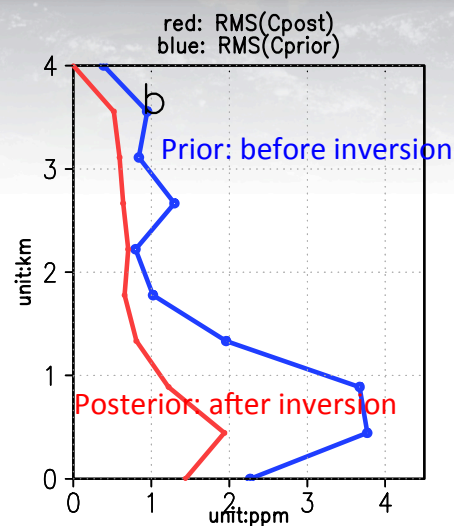
A method for independent validation of inverse modeling: application to CO₂

Problem: Net carbon fluxes are inferred from CO₂ concentrations, e.g. OCO-2, using inverse modeling. Indirect validation approaches compare modeled CO₂ to independent data, e.g., aircraft. *What fluxes drive the agreement between predicted and independent concentration data?*

Liu and Bowman, GRL, 2016, developed an adjoint method that attributes differences between predicted and independent data back to surface fluxes.

- Using a Carbon Monitoring System Flux (CMS-Flux) Observing System Simulation Experiment (OSSE), posterior (after inversion) CO₂ error is 50% less than prior.
- Only sub-equatorial Amazonian fluxes (in blue) drive improved CO₂ agreement.
- Method is being applied to validate inversions with GOSAT and OCO-2 data.
- Can be used by ATom and ACT-America to validate regional and global inverse models.

Mean RMS difference between modeled and aircraft CO₂, which are located at 4 locations in the Amazon



reduction of CO₂ errors (ppm²) from the changes of fluxes at each point

